



Joint ADL Co-Lab BAA

COCOMO-SCORM: Content Complexity Measurement Tool

Contract #: N61339-05-C-0115

**Project Kick-off Meeting
17 October 2005**



Agenda



- **JADL Co-Lab (9:00-10:30)**
 - Purpose of Meeting
 - Contracts
 - Lessons Learned from past prototype programs
 - Goals of the 2005 prototype program
 - Roles—Yours
 - Roles—Ours
 - Deliverables
 - Information Sharing
 - Questions
- **Sparta/Anteon (10:30-12:00)**
 - Project Overview
 - Team
 - Schedule
 - Deliverables
 - Option
 - COCOMO & ADDIE
 - Next Steps
- **Lunch (12:00-1:00)**
- **Overview Briefing to JADL Co-Lab Director/Deputy (1:00-2:00)**
- **Admin/Questions/Tie up loose ends (2:00-3:00)**



Project: COCOMO-SCORM

BAA Research Interest Statement:

“Web-based and SCORM content is difficult to measure in terms of complexity and development time; however, most people would agree that there are certain qualities that make some content more difficult to develop than other content (like level of interactivity). What is needed is an algorithm that takes into account all of the decision points an instructional designer and later the software developer makes when designing and developing SCORM content. Being able to quantify this in a comparative numerical measure would make development and test cost estimates more meaningful and accurate; thereby, reducing risk to a content development program.”

Proposed Technical Concept:

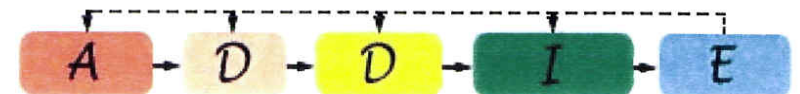
“Every complex project requires project managers and sponsors to calculate the expected level of effort, duration, and cost of the project. Developing web-based content to the Sharable Content Object Reference Model (SCORM) is complex enough that an algorithm is necessary to assist both the government and developers in estimating the size of the project. SPARTA and Anteon propose to create an interactive courseware estimation tool based on widely used Instructional Systems Design (ISD) methodologies and on the principles contained in the well-established and widely accepted COCOMO II model for software project estimation.”



Project Description

- Create an interactive project estimation tool for ISD/SCORM content
- Algorithmic foundation for the tool is the COCOMO II algorithm developed for software projects by the research team at the University of Southern California and led by Barry Boehm
- ISD methodology estimated will be the ADDIE model developed at Florida State University and adopted by the U.S. Armed Services
- Resulting algorithm and tools will estimate the duration and staffing for a project involving SCORM content
 - Dollar costs can be derived outside of the model by applying industry or specific company labor rates

COCOMO II





Problems to Solve

- Enumerate SCORM products and processes that contribute to the staffing and duration of a project
- Identify mathematic and logical relationships between these items
- Quantify the level of contribution of each item to project cost
- Define a bounded set of conditions under which the algorithm can be relied upon
- Validate the algorithm for various states of data within the bounded set



Applicability & Value to Community



- Consistent, objective, and reliable estimation tool for SCORM content an projects
- First step in formalizing an estimation method in the ADL community
- Create a tool that other projects can apply, modify, and mature
 - COCOMO II has been evolving for 25 years.
 - COCOMO-SCORM tool from this BAA will be the first step in the long evolution and improvement of a tool for this community



Team: SPARTA & Anteon

- **SPARTA**

- 1,300 person, \$250 million defense services provider.
- Leading developer of software, systems, and mathematic algorithms for all of the defense services and the intelligence community.
- Intimately familiar with the issues of project management and estimation and are prepared to apply the best algorithms from software tools like COCOMO II and our own implementations of the SEI CMM processes to this project.

- **Anteon**

- 7,200 employees at over 100 offices and a contract backlog of \$4.3 billion
- Successful history of developing advanced distributed training programs, performing assessment and evaluation services, and implementing training products into our clients' delivery environments.
- Advanced Distributed Learning initiative partner, member on the Government's Accessibility Board, and a SCORM adopter.
- Our personnel have successfully performed all aspects of each phase of the ADDIE Model from preliminary tasks such as Needs Analysis and Job/Task Analysis to concluding Summative Evaluation tasks at Kirkpatrick's Level 3 evaluation.



Team: Personnel

- **SPARTA**
 - Roger Smith, PM
 - Seth Lytle
 - Lacey Edwards
- **Anteon**
 - Kelly Ward
 - Denise Stevens
 - Tatyana Pitts
 - Tim Richey



Team: Collaboration

- **Continuous Research Collaboration**
 - Daily telephone and email exchange
- **Bi-weekly Meetings**
 - Face-to-face exchange of ideas and progress bi-weekly
- **Monthly Sub-contract Report**
 - Monthly written report of progress, status, and future plans
- **In Process Review**
 - Pre-government meeting preparation and collaboration
- **I/ITSEC 2006 Paper Preparation**
 - Collaborative development of paper abstract, draft, and final
 - Abstract: February 2006
 - Draft Paper: June 2006
 - Final: October 2006



Schedule: Phase 1

Task	Duration	Start Date	Finish Date
1.0 Algorithm Development			
1.1 Project Management - Algorithm	33 weeks	10/10/05	6/9/06
1.2 Project Kick-off Meeting	2 days	10/17/05	10/18/05
1.3 Research COCOMO Variables	10 weeks	10/10/05	12/16/05
1.4 Research ISD Cost Items	10 weeks	10/10/05	12/16/05
1.5 Develop COCOMO-SCORM Algorithms	10 weeks	12/19/05	2/24/06
1.6 Prepare and Conduct In-Process Review	1 week	2/27/06	3/3/06
1.7 Create COCOMO-SCORM Software Model	11 weeks	3/3/06	5/19/06
1.8 Create Prototype User Interface	10 weeks	3/6/06	5/12/06
1.9 Create Algorithm Documentation	2 weeks	5/22/06	6/2/06
1.10 Prepare and Conduct Final Project Review	1 week	6/5/06	6/9/06
1.11 Validation Tests	Interspersed	12/19/05	6/2/06
Total	33 weeks	10/10/05	6/9/06



Deliverables: Phase 1

Deliverable	Description	Delivery Date
DI-MGMT-81117	<u>Technical and Management Work Plan.</u> 1) Project Schedule	12 October 2006
DI-MGMT-80227	<u>Contractor's Progress, Status and Management Report.</u> 1) Monthly progress reports (Due: 7 th day of each month) 2) In-Process Review presentation material	<u>Monthly Progress Reports</u> 07 November 2005 07 December 2005 09 January 2006 07 February 2006 07 March 2006 07 April 2006 08 May 2006 <u>IPR Material</u> 03 March 2006
DI-MCCR-80700	<u>Computer Software Product End Item.</u> 1) COCOMO-SCORM Application Software 2) COCOMO-SCORM User Documentation	09 June 2006
DI-MISC-80711A	<u>Scientific and Technical Report.</u> 1) Project Final Report	09 June 2006



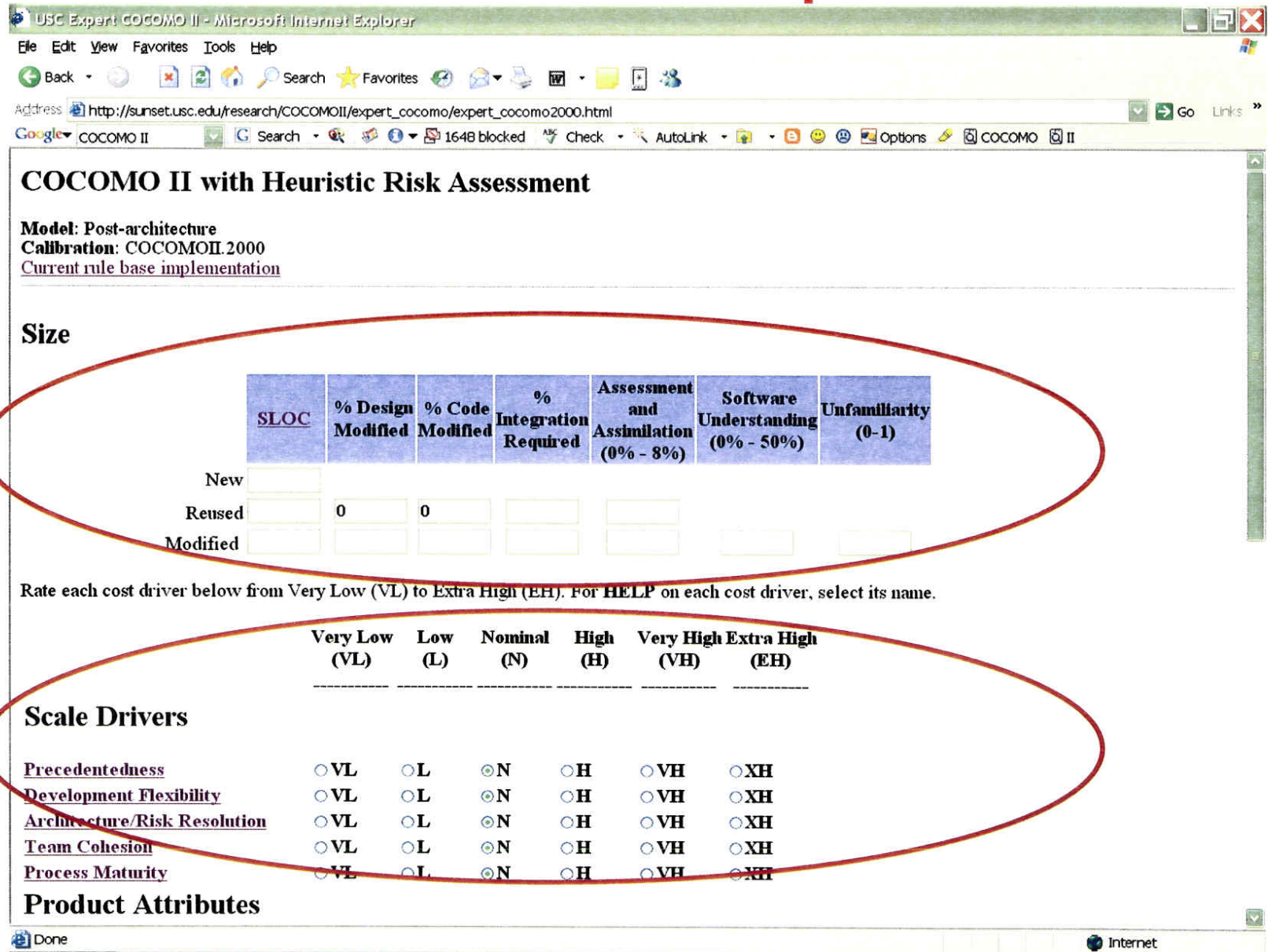
Option: Phase 2

Task	Performance Period
2.0 Professional GUI Develop	
2.1 Project Management - GUI	16 weeks
2.2 Create Professional GUI	10 weeks
2.3 Interface with COCOMO-SCORM Spreadsheet	2 weeks
2.4 Create GUI Documentation	2 weeks
2.4 Prepare and Conduct Final Project Review and Demonstration	1 week
2.5 Create Final Report	1 week
Total	16 weeks



COCOMO History

- The Constructive Cost Model (COCOMO I) was first published in 1981 by Barry Boehm. Its ability to estimate software projects led to its almost universal adoption and continued research that led to the creation of COCOMO II in 1998.
- Since 1981, the COCOMO estimation method has been adapted to serve a number of different types of projects, e.g.
 - Systems Engineering (COSYSMO)
 - COTS Acquisition (COCOTS)
 - Cost, Schedule, Quality Balance (COQUALMO)
 - Rapid Application Development (CORADMO)
 - Productivity Improvement (COPROMO)
 - Lifecycle Costs (COPSEMO)
- Next: COSCORMMO, COADLMO, COISDMO





COCOMO II Drivers (29+ Input Variables)



- **Size**
 - Source Lines of Code
 - Design Modification
 - Code Modification
 - Integration
 - Assessment
 - Understanding
 - Unfamiliarity
- **Scale**
 - Precedentedness
 - Development Flexibility
 - Arch/Risk Resolution
 - Team Cohesion
 - Process Maturity
- **Product**
 - Required Reliability
 - Database Size
 - Product Complexity
 - Required Reuse
 - Documentation
- **Platform**
 - Execution Time Constraints
 - Main Storage Constraints
 - Platform Volatility
- **Personnel**
 - Analyst Capability
 - Programmer Capability
 - Personnel Continuity
 - Applications Experience
 - Platform Experience
 - Language/Toolset Experience
- **Project**
 - Use of Software Tools
 - Multisite Development
 - Required Development Schedule



ADDIE History

- The five phases of the ADDIE Model – Analysis, Design, Development, Implement, and Evaluate – were developed in 1975 by Florida State University and adopted by the U.S. Armed Services as a valid Instructional Systems Design approach to training development.
 - Framework for Department of Defense Instructional Systems Design and Standards Approach to Training (MIL-HDBK-29612-2A).



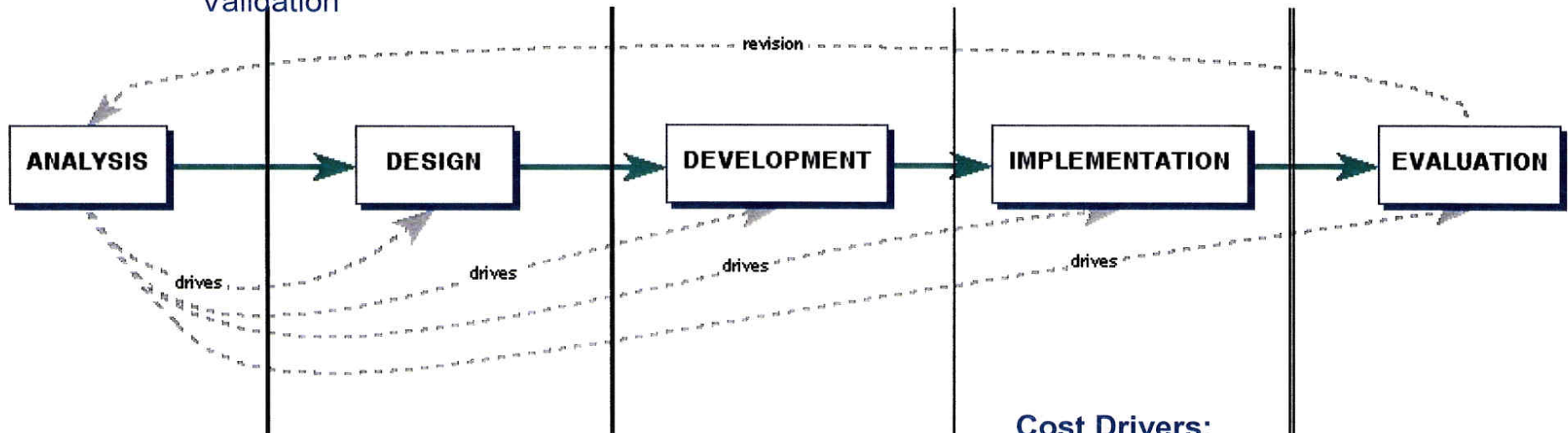
Sample ISD Products:

Job/Task Analysis
Needs Analysis
Learning Analysis
SCORM Plan
Storyboards
Testing
Multimedia
Instructional Media Package
Reliability
Validation

ADDIE Process



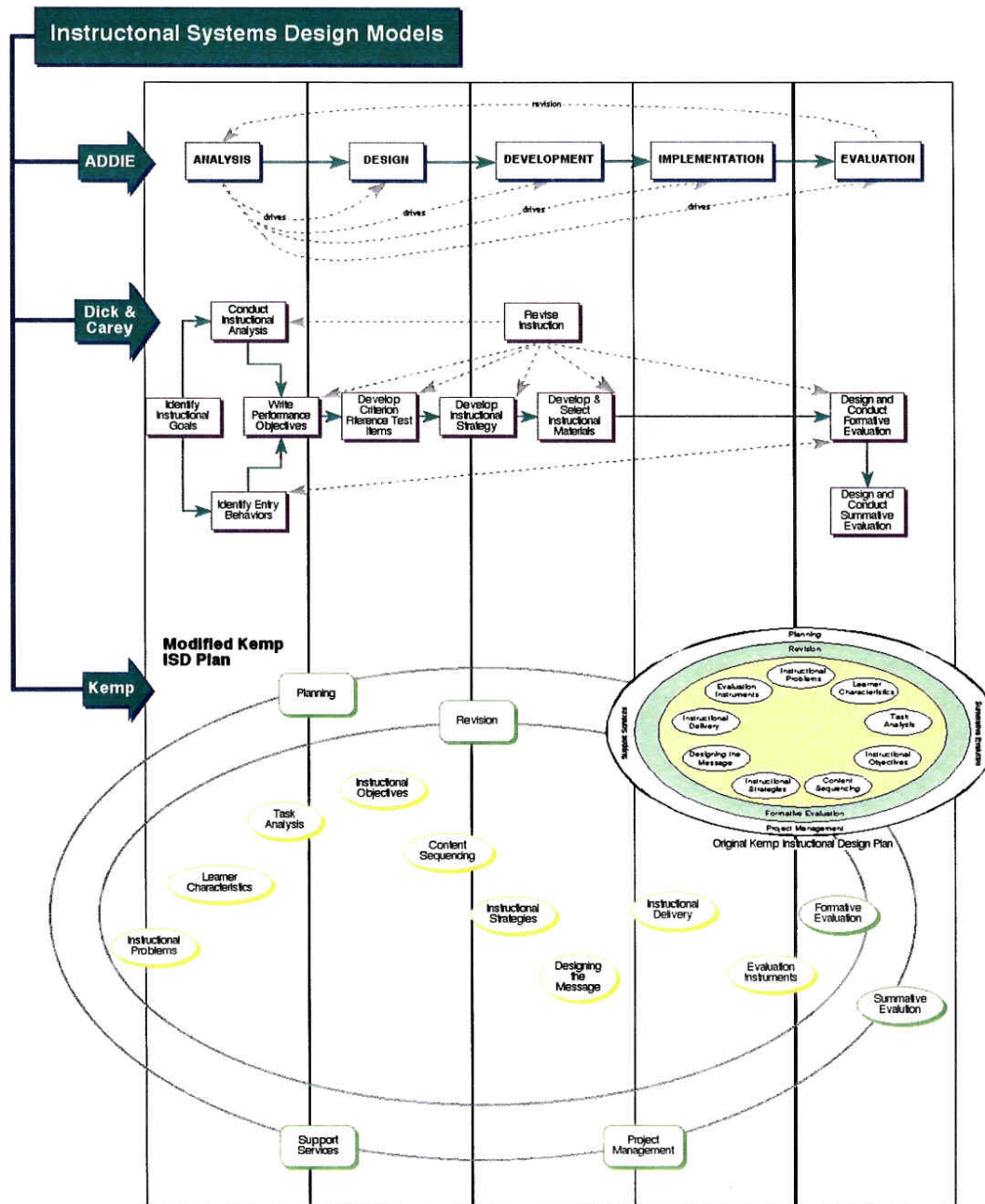
Storyboards
Training Plans
Testing
SCORM Plan
Validation



Cost Drivers:

Entry point into process
Levels of interactivity
Levels of multimedia
Target audience
Target environment

Other ISD Models





Conclusion

- First step in applying a rigorous algorithm to the problem of estimating SCORM content costs
- Numerous modifications of the COCOMO method have been successfully developed in the past and we expect to add one more success to that list.



Next Steps

- **Technical and Management Work Plan (DI-MGMT-81117)**
- **Collaborative Research**
 - COCOMO Variables
 - ADL Cost Items
- **Algorithm Development**
- **IPR**